GE
Lighting

roadway

re-imagining roadways

taking the science of **light on the road**

imagination at work

street-smart from the start

Over a century ago, GE created the first streetlights, and we've been mastering the technology behind roadway fixtures ever since. More than one hundred years and thousands of miles of street lighting later, our passion for innovation still burns bright.

In 1962, GE scientist Dr. Nick Holonyak Jr. invented the first visible LED, leading the way to the next generation of lighting solutions. Today, we have applied our expertise in outdoor fixture and LED systems design to bring you our award-winning GE Evolve™ LED Roadway Scalable Cobrahead (ERS) fixture.

Building on a reputation for excellence that dates back to Edison's first electric light bulb, GE brings a depth of expertise that's unsurpassed in the industry. From day one, we've been here, ready to work with you to provide a solution that helps save energy while bringing greater aesthetics and overall cost savings to city streets and roadways. And you can count on GE to be there as we continue to lead the lighting revolution.

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industry experts pick GE as best-in-class

Our forward thinking has been recognized repeatedly by the industry. Most recently, GE's Evolve ERS fixture was awarded a Best-in-Class designation in the 2012 Next Generation Luminaires™ Solid-State Lighting Design Competition (NGL) in the Roadway Lighting category. Sponsored by the U.S. Department of Energy (DOE), the Illuminating Engineering Society of North America (IES), and the International Association of Lighting Designers (IALD), the NGL awards were created to recognize excellence in energy-efficient LED commercial lighting unit design.

The Evolve ERS was also recognized for its pioneering design and technical excellence, winning the 2013 LIGHTFAIR® International Innovation Award category for Parking, Roadway and Area Lighting, and a 2012 Architectural SSL Product Innovation Award (PIA).

LIGHTFAIR INTERNATIONAL 2013

Next Generation 2012 LUMINAIRES

Illuminating ENGINEERING SOCIETY

U.S. DEPARTMENT OF ENERGY

pia 12

IALD

differentiating factors

We've applied the science of light and our expertise in roadway fixtures to integrate application efficiency and reliability into every Evolve ERS fixture. The foundation of our exceptional, high-performance LED roadway lighting solution revolves around GE's custom designs.

optical design

Unique reflective optic design

- Non-pixilated light distribution to minimize distracting glare
- Optimized to meet IESNA RP-8 recommended practices for luminance, illuminance and small target visibility design
- Excellent light control aims the light directly where you need it
- Low light trespass and zero up-light
- High optical efficiency and utilization of light
- Lower power consumption required for the target roadway space

mechanical design

Removable power door assembly

- Makes electrical components easily accessible for replacement or repairs
- Tool-less or single-tool entry and quick connects

Dust & dirt mitigation

- Flat tempered glass lens and IP65 rated enclosed cavity minimize effects of dirt to provide consistent light distribution over the life of the product

electrical design

One manufacturer of complete system

- Reliable GE Lightech™ LED Driver powers the GE Evolve LED fixture
- Entire system, including driver, fixture and controls are made, tested and warranted by the same manufacturer to ensure long-term system reliability

Standard surge protection against multiple strikes

- Surge protection against multiple strikes comes standard, with optional high-capacity protection available

reliability & performance

Extensive testing of the LED, subsystem and complete system

- Conforms to the most stringent regulatory and performance requirements including UL, Design Lights Consortium (DLC) and International Dark-Sky Association (IDA)
- Provides applicable supporting performance documentations such as including TM-21, LM-79 and LM-80 reporting methods
- Rather than rely solely on test data from LED suppliers, we extensively test the complete system to validate performance

controls capability

Available with both wireless network and stand-alone control capability

- GE LightGrid™ Outdoor Wireless Control System allows remote monitoring, utility-grade energy metering and GPS mapping of streetlights
- GE Montior™ Stand-Alone Controller is a two-for-one solution offering both photo control and dimming in a single package
- Adaptive controls ready, without any additional internal electrical components required

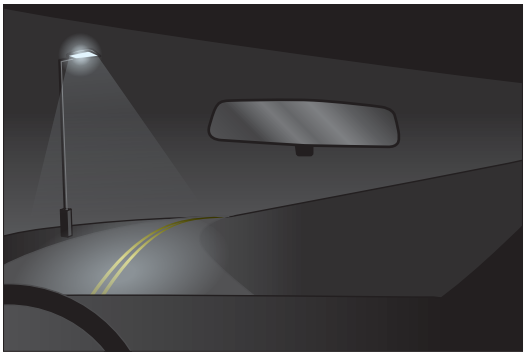
optical design

aiming to please

GE uses an advanced reflective optic design that meets RP-8 recommended practices for luminance, illuminance and small target visibility. This unique design ensures that Evolve ERS fixtures will deliver light control with significantly less waste than the other optical technologies used by many of our competitors.

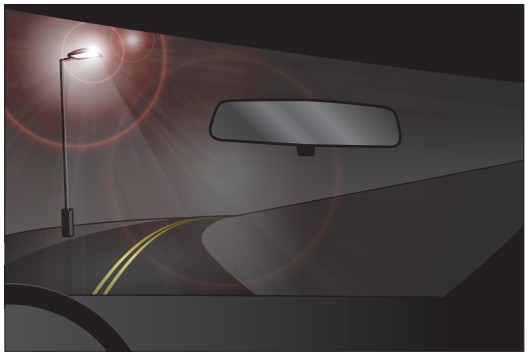
Evolve ERS fixtures have improved ratings for backlight, up-light and glare (BUG ratings) to direct more light on the road and not in neighboring properties or in the eyes of nighttime drivers, meeting tight local ordinances and International Dark-Sky (IDA) requirements.

GE



Our unique reflective technology allows us to focus light where it's needed – on the road – with less glare.

COMPETITION



The refractive technology design used by other manufacturers typically results in more wasted light trespass and glare for drivers.

minimizing glare

GE's innovative reflective design only puts light where it is needed and minimizes direct view of the light source with a non-pixilated appearance.

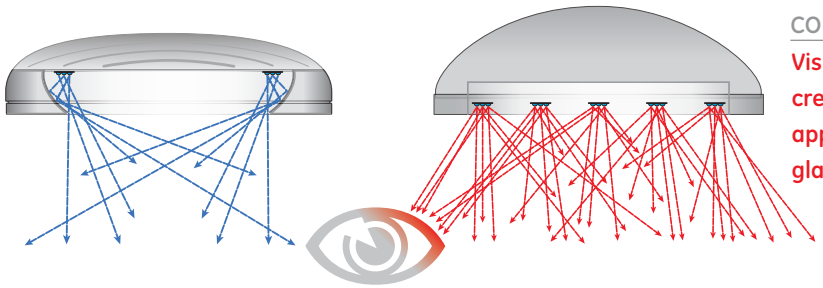
GE design recesses the LED array within the optic (or reflector) to limit visibility of the LEDs from the drivers' field of view, minimizing glare. Many competing optical designs use LED arrays with individual optics, making the entire array visible to the driver, resulting in a pixilated appearance with higher levels of glare and increased light trespass.

SPEC ALERT

GE's unique reflective optic design delivers a non-pixilated light source with exceptional light control to provide low light trespass, zero up-light and minimized glare.

GE

Minimized visibility to LED light source, creating non-pixilated appearance to driver's field of view

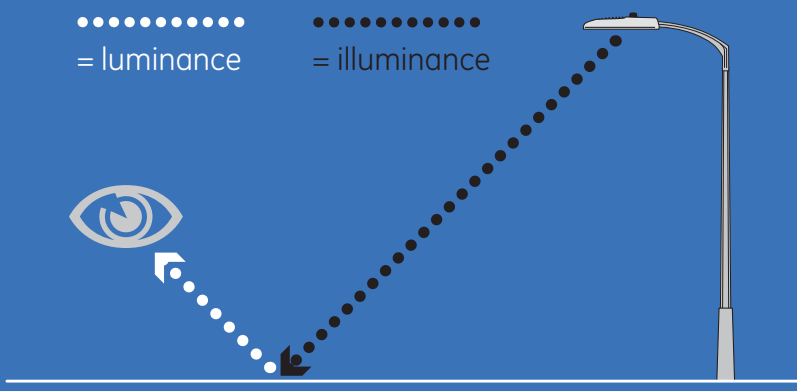


COMPETITION

Visibility to every LED, creating a pixilated appearance and increased glare to driver's field of view

why is luminance an important focus of GE's optical reflector design?

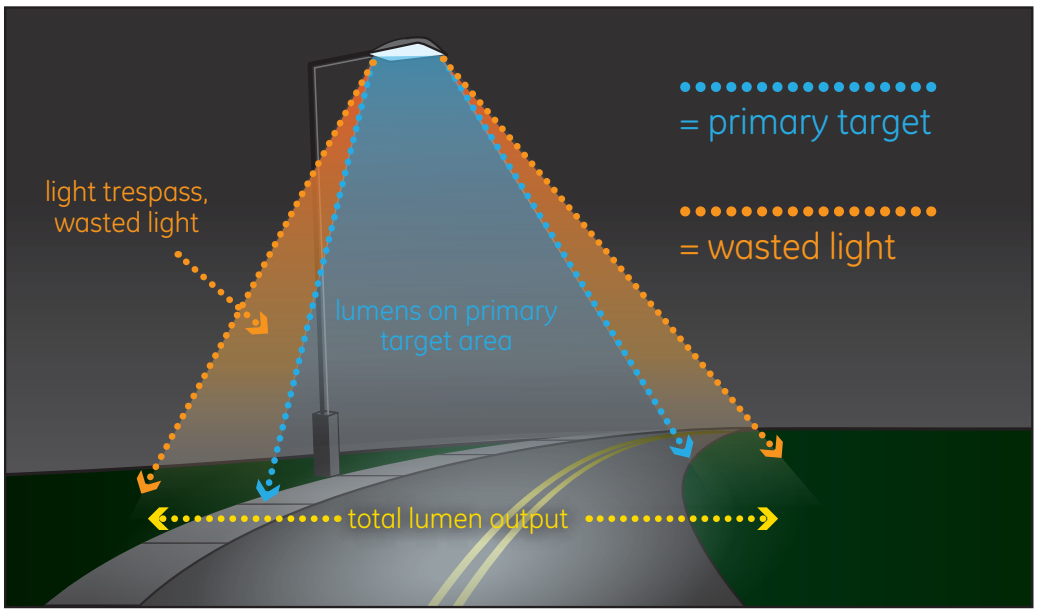
GE optical design provides outstanding overall visibility while driving, offering reflector optics that were designed with the driver in mind. This design only puts necessary light at and above 45° angles, reducing glare to the driver. GE provides consistent luminance uniformity in the driver's center field of view, while many competing products have greater variation. GE also ensures reduced glare at the critical angles, improving small target visibility which allows drivers to detect objects faster while driving. The uniformity of light in the driver's field of view improves the retina image. Designing for the driver's field of view with consistent retina light levels provides excellent overall visibility while driving.



optical design

light on target: coefficient of utilization

By putting energy toward the task of lighting the roadway and not the surrounding area, Evolve ERS fixtures put light where it is intended and provide more efficient utilization of light. This is known as coefficient of utilization or (CU), and is a key characteristic of any fixture when determining its ability to light the intended area. A higher CU means less wasted light which, in turn, means lower energy consumption. This will reduce costs over the life of the fixture.



Efficiency in action

- Lumens per Watt (LPW) = Total Lumen Output/Total Watts
- Coefficient of Utilization (CU) = Lumens on Primary Target Area/Total Lumen Output
- Higher the Coefficient of Utilization (CU) = Less Wasted Light

application efficiency

Although "lumens per watt" (LPW) is a measure of total output of a fixture and its power consumption for lumens produced, it is not a measure of how effective the fixture is in efficiently lighting the roadway and eliminating wasted light (and energy). It is important to understand the RP-8 recommended lighting practices, along with other unique specification requirements for each application.

In the application example shown below, the customer specification was to meet IESNA RP-8 requirements. Of the three fixtures evaluated, GE's Evolve ERS is the only one to meet all of the RP-8 criteria. GE also has the highest CU rating, meaning the Evolve fixture is efficiently lighting the roadway with less wasted light and less wasted energy.

					KEY PERFORMANCE CRITERIA					
description	fixture watts	fixture lumens	fixture LPW	application CU	Eavg	Eavg/ Emin	Lvmax/ Lavg	Lavg	Lavg/ Lmin	Lvmax/ Lmin
RP-8 Target					=> 0.4	=> 6.0	=< 0.4	=> 0.3	=< 6.0	=< 10
GE Evolve ERS	54	4,300	80	71%	0.41	4.1	0.3	0.3	3	6.4
competitor 1	70	7,000	100	50%	0.47	2.76	0.39	0.44	2.59	6.53
competitor 2	66	6,100	92	50%	0.41	4.56	0.33	0.36	2.25	6.38

pole spacing = 190' mounting height = 30' road width = 30' (two lane) LLF = 0.765 (0.85 LLD x 0.90 LDD)

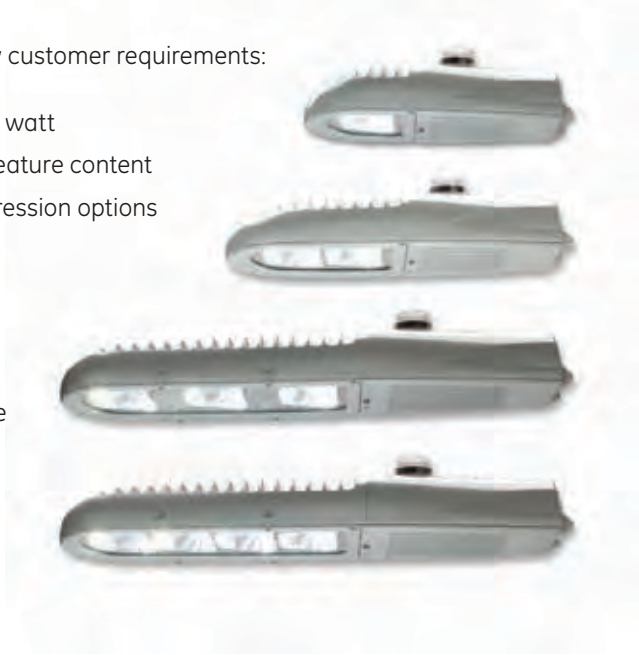
This information is calculated from data publicly available at the time of printing. GE and competitor products and offerings may change at any time without notice.

mechanical design

flexibility in design

GE offers a range of roadway lighting solutions to meet a wide variety of key customer requirements:

- Complete scalable lumen range
- Wide range of photometric selections
- Optimized wattage choices with drive current options
- Lumens per watt
- Luminaire feature content
- Surge suppression options



fixtures that stand the test of time

Advanced engineering at its best, Evolve ERS balances the technical needs of a sophisticated LED system with the functional demands of an outdoor fixture facing the year-round hazards of Mother Nature. The Evolve ERS has a broad operating temperature range of -40°C to +50°C, going above and beyond most standard fixture ratings to withstand potential extreme conditions.

The surface is protected by corrosion-resistant polyester powder paint applied at a minimum thickness of 2.0 mil to accommodate the long life of the fixture.

Corrosion-resistant polyester powder paint finish
ANSI photocell socket easily turns to "NORTH" without tools. Optional dimming control receptacle available.
Robust casting with heat sink fins for maximum heat transfer
Protective clear tempered glass lens
GE's advanced reflective optic system
Removable power door
Convenient, reliable, quick disconnects
Optional tool-less entry
Proven, reliable GE driver with integral, industry-recommended surge suppression

installation made easy

The Evolve ERS fixture has a removable power door with tool-less or single-tool entry with quick connects, which makes driver components, electrical connections, control wiring and other optional electrical components easily accessible for replacement or repairs.

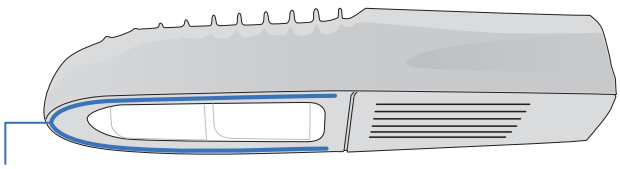
optimized thermal management

A robust heat sink design keeps the critical components cool without relying on air movement to maintain reliable performance over the life of the fixture. Our cooling fin design and 16-gauge metal clad aluminum circuit boards with a single circuit layer help to maximize heat removal, resulting in longer life, reduced lumen depreciation and exceptional performance.

dust and dirt mitigation

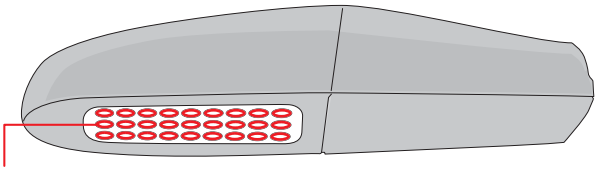
The Evolve ERS fixture houses the LEDs and reflectors in a dirt- and dust-free cavity with an IP65-rated optical enclosure and a tempered glass lens to minimize the effects of dirt. This design approach provides consistent light distribution over the life of the product.

GE



Flat, tempered glass lens protects the LED optical enclosure. Lens surface is smooth and flat which is less prone to dirt accumulation.

COMPETITION



Designs that have exposed refractive optics have more crevices (or surfaces, edges, pockets) prone to dirt accumulation that could adversely affect the beam distribution pattern.

SPEC ALERT

The power door on GE's Evolve ERS is removable for field maintenance and accessible through tool-less or single-tool entry. It also incorporates a tempered glass lens and IP65-rated optical chamber for easy cleaning.

electrical design

dependable drivers

Reliable GE Lightech drivers power Evolve ERS roadway fixtures. You can rest assured that the entire system, including driver, fixture and controls, is made, tested and warranted by the same manufacturer to ensure long-term system reliability.

surge protection

LED fixtures require robust surge protection devices to protect valuable components from voltage spikes and surge events over their operating life. Many surge protection devices are only rated for a single event. GE knows that a product's ability to survive repetitive events is key to maintenance-free operation.

GE's standard transient voltage surge suppression (TVSS) exceeds the U.S. DOE Municipalities Solid State Lighting Consortium (MSSLC) specification for surge protection devices. Evolve LED roadway fixtures come standard with a surge protection device verified to provide protection against at least 120 combination wave events of 6kV/3kA per IEEE/ANSI C62.41.2-2002. An optional high-capacity protection device that can survive up to 5,000 6kV/3kA events or 120 10kV/5kA (UL 1449) events is also available.

surge hit tolerance comparison

	NUMBER OF STRIKES PROTECTED AGAINST
RATINGS OF MOST COMPETITOR OFFERINGS	1-30
GE STANDARD OFFERING (6kV/3kA)	120

FOR SITUATIONS REQUIRING PROTECTION AGAINST MORE POWERFUL STRIKES

GE OPTIONAL HIGH-CAPACITY OFFERING	**5,000** 6kV/5kA **120** 10kV/5kA

SPEC ALERT

Reliability. Fixture should include minimum of 6kV/3kA surge protection and include options for high-capacity protection of 6kV/5kA and 10kV/5kA.

reliability & performance

tried and true

Impressive long-life technology makes LED systems a long-term investment. Lasting significantly longer than traditional lighting sources, LED systems offer tremendous energy and maintenance savings that easily justify their higher upfront cost. But not all LED systems perform equally over their years of operation.

Inferior quality products can prematurely fail or degrade in light output far below initial claims — which results in failure to provide the value originally promised. At GE, our product life ratings recognize acceptable light levels for any given application to ensure you won't be left in the dark.

1 million+ unit hours

16,000+ hours at +60˚C ambient

Rather than rely solely on test data from LED suppliers, we extensively test the complete system, using both in-house and independent labs around the world to validate performance. GE has accumulated more than 1 million unit hours of testing and more than 16,000 hours of testing at +60°C ambient, going beyond the industry's standard level of testing to ensure our fixtures can live up to our claims.

At GE, we know our fixtures can stand the test of time because we've designed them that way. It is this diligent approach to quality assurance that has earned GE a reputation as one of the most respected names in the industry.

control capability

you're in control

While some might be satisfied with winning awards and industry recognition, we've never stopped to rest on those laurels. Instead, our team went the extra mile to bring you a whole new level of flexibility, efficiency and control.

Evolve ERS fixtures are available with both wireless and non-wireless stand-alone control capability. The control module connection is made externally through an optional dimming control receptacle, making Evolve fixtures adaptive control ready.

Compatible for use with control options ranging from a simple shorting cap to a standard PE photocell control, to our GE Monitor Stand-Alone Controls or sophisticated GE LightGrid Outdoor Wireless Control System, this solution allows for easy upgrading to other control solutions down the road, without any additional internal electrical components required.

GE Monitor™ Stand-Alone Controller

The GE Montior Stand-Alone Controller is a two-for-one solution offering both photo control and dimming in a single package. This non-networked solution turns on at dusk, dims at preset times, then returns to full brightness at 5 a.m., until it turns off at dawn. It helps achieve energy savings without the need for additional components or cost, attaching easily with a turn-and-lock receptacle that is fully compatible with existing photocells.

STANDARD SHORTING CAP

STANDARD PE PHOTO CONTROL

GE MONITOR STAND-ALONE CONTROLLER

GE LIGHTGRID OUTDOOR WIRELESS CONTROL SYSTEM

5-pin dimming receptacle will accept any standard PE, GE Monitor Stand-Alone Controller or GE LightGrid Outdoor Wireless Control System.

GE LightGrid™ Outdoor Wireless Control System

Harnessing the power of the industrial Internet, GE LightGrid Outdoor Wireless Control System combines the best in outdoor lighting and controls with award-winning LED technology.

Measurably smarter, LightGrid outdoor wireless controls let you map and monitor every individual streetlight fixture, continually reporting energy usage and lighting data to a central management system accessible through a Web-based interface.

Armed with actionable information, municipalities and transportation departments can implement smarter energy-saving strategies through more precise on/off and dimming schedules, particularly during a middle-of-the-night operation in low traffic areas.

- Accurate, utility-grade energy metering per pole
- One piece control; node simply connects to external socket
- GPS chip embedded into node, which automatically connects to network and displays GPS coordinates in Google Maps
- Updates are easy with "over the air" firmware upgrades
- Sends automated fault email notifications
- Access scheduling, customized reporting, grouping and user access level management
- Operates with programmed schedules in case of network outage

Together with award-winning Evolve LED roadway lighting fixtures, LightGrid will deliver the energy efficiency, reliability and flexibility needed to optimize street and roadway lighting within a given geographic area.

SPEC ALERT

The control module connection is made externally through an optional UL-Listed dimming control receptacle. For Utility Grade Metering, LightGrid provides +/- 2 percent power measurement accuracy. LightGrid also provides GPS and self-commissioning, so you always know the exact location of controllers and fixtures.

total solution

the GE Advantage™

1. Discovery & Design
Before we illuminate, we listen. By understanding your goals and the makeup of your existing infrastructure, we can optimize a design that will meet codes, legislation and your objectives.

2. Innovative Systems
Our unique reflective technology and broad product portfolio mean the best possible lighting solutions.

3. Seamless Distribution
Our recently re-imagined manufacturing facility and local support networks ensure products are available and on time.

4. Integration Services
Whether it's new construction or an update of existing infrastructure, our network of partners provide turnkey installation solutions.

5. ROI Optimization
We'll help you see financial benefits – as soon as the first month – through energy savings, utility rebate capture programs and financing options.

responsive commercial services

- **world-class commercial services**
- **$35 million investment**
- **10 days or less lead time**
- **95%+ fill rate**
- **24-hour online order work flow and access**

Delivery delays, and design or installation uncertainties can create a domino effect on major projects. That is why we invested $35 million in our Hendersonville, N.C., plant to optimize manufacturing speed and efficiency. Guided by LEAN principles, pull replenishment and Six Sigma, we reduced order fulfillment from an industry standard of four to six weeks to 10 days or less, with a 95 percent or higher fill rate. Even faster in emergencies or out-of-stock situations, with 24-hour turnarounds possible. In addition, the new GE Customer Connect Internet-based system simplifies order management to ease inventory management and installation planning all the way down the line.

realizing rapid returns

Our LED fixtures alone save significantly over non-LEDs, but that's just the start of the savings you'll see with GE. With lumen maintenance ratings of L85 at 50,000 hours, Evolve ERS fixtures offer more than 11 years of reliable service life with little to no maintenance, based on 12 hours of operation per day. This provides substantial cost savings on replacements and manpower needs. GE lighting controls and preset dimming maximize savings on energy. GE Capital Corporate Financing can help you secure funding that, in many cases, is recovered through savings in energy and maintenance costs – resulting in a positive cash flow status from day one. And, we can work with you to capture any available rebates – all to help you realize a real return on your investment for years to come.

get on the fast track to the future

Our expertise was built over 100 years of leadership and innovation. Schedule a complimentary Lighting Energy Audit, and we'll help you put your streets and roadways in the best possible light.

Visit gelighting.com/roadway to schedule your audit.

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